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THEY TAKE MUCH UPON THEMSELVES:

A LETTER FROM KAZAN UNIVERSITY

- USSR -

by Anatoliy Agranovskiy

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205 EAST 42nd STREET, SUITE 300
NEW YORK 17, N. Y.

JPRS: 3967

CSO: 4336-D

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[Following is a translation of an article by Anatoliy Agranovski in the Russian-language newspaper Izvestiya, Moscow, No. 143, 17 June 1960, page 5.]

In brief, the story was as follows.

Hioitiro Takeno lives in Hiroshima. Boris Vavilov lives in Kazan. Takeno is a professor. Vavilov is a student. The professor is the head of an institute for theoretical physics; the student is working on a degree. They know nothing of each other.

However, Takeno publishes his work "On the Theory of Gravitational Waves." He knows that the Russian physicist Petrov is working in this field. As is the custom in the scientific world, he sends a copy to "USSR, Kazan, University, Petrov." Professor Petrov who is a busy person gives the copy to his student and says: "Read this, Boris! Study it well. And give a report to the seminar."

Late in the evening the student hurries to the professor's home. "Aleksey Zinov'yevich, Takeno made a mistake! I checked his equation. Here are the calculations. You see, the solution is imaginary...." They sit down together, the teacher and the student, and check the calculations; as a result, in the article of B. Vavilov (in the magazine Izvestiya Vuzov /News of Universities/, No. 2, 1959) there appears the statement:

"... The calculations showed that for a non-plane space of time the discriminant of this equation cannot be positive."

This is the way physicists write and support their conclusions with a dozen formulas which are even less intelligible to us mere mortals. However, I shall skip the "science" just as I shall skip a description of the inner turmoil of the Japanese physicist. Rather I will speak of the final episode. The mail brings to Kazan a new publication by H. Takeno "On the Subject of Errors in My Work 'On the Theory of Gravitational Waves.'" The author, as is the custom in the scientific world, admitted his mistake and thanked his "colleague Vavilov" for his help.

Such is the story. What is there in it which is interesting and instructive?

The young student was so bold that instead of studying with trepidation and summarizing and memorizing this authoritative work he took it upon himself to check it. There might be no mistakes -- this was pure chance -- however, there was no element of chance in the way in which the student approached his work.

Therefore, I cannot limit myself to a short recitation of the story. I must draw a "moral" from it. We must understand from where such young people come.

From our youth we all dream of accomplishing great things. Encounters with reality check us and life, as the saying goes, teaches us. In a weak person this teaching blurs the dream. He becomes sober with years and grows "wise." He acquires a depressing picture of the "real opportunities" which must be weighed in advance before undertaking a cause. This means that only those things "which can be accomplished" are undertaken. And the person reaches ever less often to the skies but rather contents himself with titmice which are good only in that they are in one's hands...

"In time you will hear great praises," Professor Petrov told me; "He is a good graduate student, modest and industrious. I prefer intense young people. Let them argue and fight for their views. If some young fellow comes out with a stupidity, he can be corrected or ridiculed. However, if he comes out with nothing but only stares at your mouth ready to mimic everything you say, of what use is he?"

Boris Vavilov was obviously one of the "intense" ones.

A name speaks loudly in the scientific world; however, Boris is not related to a former president of the Academy of Sciences. His father, Trofim Ivanovich Vavilov, was a plasterer who at the age of 9 years had gone "to the people." Now he is receiving a pension and lives with his wife in a place 30 versts from Chistopol' on the Volga. At home he keeps copies of all his son's scientific works. The son comes on his vacations and goes with his father to the forest to hunt mushrooms; here the old man invariably starts a serious male conversation. "Tell me, Boris, what are you doing? What news is there in science?" "But you won't understand, papa." "Oh, Bor'ka, you're getting to big for your britches! It's not good... After all, I was a driver during the war and know electricity. Try, nevertheless, to tell me. Perhaps I will understand." Boris tried. "Papa, we have such a concept of a field..." and he saw that his father envisaged a green field. "And Takeno, papa, working from the equations of Einstein tried to picture a flat wave..." and he saw that his father pictured a wave on the Volga which somehow had become flat. Nevertheless, the old man listened attentively and absorbed everything thoroughly. In the evening while visiting grandfather Troshin, the kolkhoz stableman, he spoke, while pointing a knobby finger as if into a strange realm, of how "our Bor'ka devoured the Japanese Takeno."

"... In school there was a good physics teacher" would be the phrase with which one would expect that the story of the scientific course of Boris Vavilov would begin. He was lucky in his teachers. At the university he first became interested in paramagnetic resonance and studied under Professor Altshuller, one of the pioneers in this field. At the beginning of his 3rd year of study, when courses were being selected, Semen Aleksandrovich gave him a theme on quantum mechanics. He studied it, it must be noted, only in the 4th year. Having noticed this capable young man, the professor immediately placed a more difficult task upon his shoulders -- this is characteristic and should be remembered.

And there was such a matter. The student was supposed to read a pile of scientific works which were the very latest and freshest in their fields. Among them was one English work. But in school he had studied French. Of course, it would have been possible to ask someone to translate it; however, Semen Aleksandrovich said: "Study the language, Boris! It's the thing to do." And the lad registered with a group and took his text book to the virgin lands where he went during the entire period of the course and there strengthened his knowledge of the language.

The next teacher was Professor Petrov. Boris himself asked for the professor after he had listened to one of his lectures. And again it was difficult for Boris. The professor gave him a new copy of a work by the Englishman Pirani. The student started to read it but understood nothing. This was a completely different field of physics. Again it was necessary to dig into the literature on the field. He studied Einstein, Bergman and the Polish physicists Infeld and Trautman. At first he was lucky. These works were in English. He profited from his lessons in the virgin lands. But then it developed that there were Italian articles by Levi-Chivita, Fintsi... Of course, the articles were not long. Petrov, who spoke fluent Italian could help his pupil. He did not help. "Study the language, Boris! It's the thing to do." And the lad obtained a blue book entitled "Fifty Lessons in the Italian Language," and killed his vacation studying it. Since that time he reads Italian fluently.

Having acquired erudition, Boris returned to the work of Pirani (this was already the 4th year). He understood the entire course of his discussion and, what is more, took it upon himself to argue with the English scientist. There were doubts and fears. There were arguments in the apartment of the professor. Petrov more than once had to rein in this intense student. However, he always encouraged this "boldness." And, as a result of their joint efforts, as they both say, "the non-uniformity of the theory of Pirani was in any case established."

A year ago in Paris at an international symposium of physicists, Petrov met Pirani. The Englishman thanked the Russian professor and his "colleague Vavilov" for their help just as the Japanese physicist had done. However, I am not writing this to indicate in any way that foreign physicists are "weak." Pirani is a real scientist and his mistake, of course, was accidental. The important thing here is something else -- a daring young fellow was taught in a daring fashion. He was always given the newest and latest material to study. While still "a greenhorn" he was brought to the front line of science where the arguments are boiling, where research is being conducted, and where the unknown begins.

Who will say that this was a mistake?

No, we do not need timid students who will cease too soon to dream of revolutions in science and want only to have a quite "passing" dissertation. It is not necessary, it is an empty thing to measure carefully the topic against the "abilities" of the youth. He should not be given a task which is below his ability or which comes only to his shoulders or to the top of his head. He should have such a goal that it takes all his strength to reach it. If he does not reach it and slips, it is too bad! Herten spoke well on this matter: "Let us presume that you do not solve the problems; however, the stimulation of your ideas of itself is a form of education."

Let this marvelous readiness of our youth to "take much upon themselves" be triply blessed!

A scientist can be educated only on the front line of science. This is true not only of the scientist but also of any good specialist such as an engineer, agronomist, teacher or doctor. Here there can be no concessions to the "provincial" nature of a university. One Kazan mathematician remarked in a conversation: "I have an acquaintance in Yelabug who is a noted theoretical mathematician." I was listening to the sentence but there was no hint of a smile or of condescension. This was indeed true. The person was a serious theoretician who lived namely in Yelabug which at one time had been a symbol of a god-forsaken place. There can be no scientific "province" because there is no second rate science. That which is not genuine science is not science at all.

I still had to show that the story of Boris Vavilov is by no means a rare exception. He was educated in the same way as are most students. The path which he followed is the same as they all follow. I saw this in Kazan and ask that you believe me. The students, be they physicists, mathematicians, geologists or chemists, always study the very latest scientific works for their courses and degrees. Actually, the advance of the youth to the front line of science has become a principle of life in these faculties.

I encounter student mathematicians from group 74-4. They are still quite green young people, noisy and gay. But Yura Vasil'yev needed English, in addition to the German which he was already studying, for a course in mathematical logic. Volodya Rayz is translating two English works and one Japanese work. All the others are doing similar things. In the laboratory for chemists I see a box with sealed tubes on the table by graduate student Yusuf Yunusovich Samitov. These contain new polymers which were obtained in the laboratory of Academician A. N. Nesmeyanov. The academician sent them to Kazan with a request to photograph the spectra of these substances. And here "scientific workers" such as the students Khayrullin and Abdrashitova are performing just such work. In the department of theoretical physics the third year students have been instructed to build instruments for determining the moisture content of grain, wood cellulose and soil by means of nuclear para-magnetic resonance. The assistant in the department, Viktor Danilovich Korepanov, gives me an explanation:

"Yes, students Fedotov and Bikhukhametova are already working. Now they are reading, translating and thinking... What? Of course, there are no such instruments. If there were, why make them? The task is not one of the simple ones. These 'moisture meters' must be light, however, and our magnets go up to half a ton. How they get out of it, I'll never know!"

I could note in passing that Korepanov himself completed school in Mozhga, a small Udmurt town. His father is a chauffeur. His mother is a cook. Before his entry "into science," he worked for 5 years as a factory engineer. There he constructed a unique device for research -- what can you do? Here's what you have to write -- for nuclear para-magnetic relaxation using the back echo method.

My notebook is full of such stories.

This is a wise method of education, drawing the students into heated scientific discussions; it develops in them a feeling of their own strength and of great confidence that they are able to manage the most complex and thorny problems of world science.

I listened as student historians argued with young physicists who were very taken by the successes of their science.

"Is the crisis of the colonial system also your work? A billion people throughout the world have escaped from under the rule of the imperialists! Is not that history? No, my friends, it is little to make an atomic bomb. It is more important that it not explode."

The students were right. But alas, I heard nothing of lively seminars in the history-philology department. They have seminars there; however, the problems which are discussed are settled. Now, for example, an international discussion is taking place on the subject of a "common market" for Europe. Already

dozens of articles have been printed in Communist and in the magazine Problems of Peace and Socialism. Meanwhile the Kazan students of the humanities are doing nothing. What are they waiting for? There were no seminars also on the collapse of colonialism and on revisionists of a new line. However, the future historian, be he a social scientist or a teacher, must know these subjects! I heard that the Kazan Pedagogical Institute held a conference on the struggle against revisionism. Docent Ye. I. Ustyuzhanin was in charge of the conference. Communists and Kom-somol members including scientific workers, graduate students and under graduate students gave talks. These were not "canned" speeches. The people had their own opinions on these most important questions; the worst enemies of Communism were attacked seriously, heavily and scientifically; their arguments were supported by facts taken from foreign literature... This was an event in the city, and the auditorium where the students spoke held a mass of people.

This means that it is possible to do something. I might add that it is not only necessary but absolutely essential. This is because each science has its front line.

Boris Vavilov is now in Moscow. He finished the university and won first place in the All-Union competition for students' scientific works. He decided to specialize in the field of quantum electrodynamics. He was sent to the capital. The rector had received a promise from Boris that he would return to Kazan.

Boris arrived in Moscow where for the first time in his life he entered the Physics Institute of the Academy of Sciences of the USSR. On the door he saw an announcement of a seminar of scientists at which Infeld would speak. This was as in a dream. Boris entered the hall and there indeed on the platform stood Leopold Infeld in person; he was speaking (fortunately in English) about his hypotheses, conclusions and suppositions. Academician Landau, also in person, was hotly attacking Infeld, while Academician Tamm was trying to pacify them. Boris sat quietly in the last row, listening and still not really believing that he was there. He was silent for awhile, but when the discussion enveloped everyone, he too rose from his place and asked a question of Infeld. Then he made a rejoinder and even permitted himself not to agree completely with the answer. The scientists-physicists were not surprised; after all, this was the normal order for them.

Vsevolod Vishnevskiy, a great Soviet writer, once said: "There I was sitting in my editorial office, waiting: the door will open and in will come ... Pushkin." How magnificently that was said! It is just this feeling -- waiting for a meeting with a person of great talent -- which must live always in our universities. Now, comrades, the door will open and in will come a tow-headed and pug-nosed person. He will adjust his coat nervously

and ask: "Where does one take the examinations? I have come to study." This is a future Newton, Lomonosov, Darwin, Lobachevskiy... They will come. They cannot help but come.

Yes, they have already come. They are studying. They are studying in Kazan University...

From the editor:

Today, we complete the publication of "Letters from Kazan University." They have been concerned with one problem -- the education of scientific cadres; however, even in the frame of this theme not all the questions which must be solved have been raised. These issues of the newspaper are held up to our readers for their judgment in the hope that these problems will be considered and that comments will arise.

The editorial board is waiting for a continuation of the discussions which were begun in the "letters." It invites scientific workers, teachers and students to participate in the discussion. We presume that a discussion of the future of scientific change will be beneficial to our universities and to our science.

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